that he is passing away. Books built on lines like those which Dr. Shufeldt follows will tend to render the time of his total extermination far distant, and, in case a second edition of this work is called for, we hope that it will be developed largely on the model shown in the chapter on bats, to our mind the best chapter in the whole work. It would be well in a second edition to omit the final chapter on museums, which, as it now stands, has no *raison d'être.*

Origin of the Cleavage Centrosomes. — Boveri, in 1887, was the first to prove that the centrosome which gives rise to the centrosomes of the first cleavage spindle is brought into the egg by the spermatozoön. This observation, made on the egg of Ascaris, led to the formulation of the following conclusion by Boveri: "The ripe egg possesses all of the organs and qualities necessary for division excepting the centrosome, by which division is initiated. The spermatozoön, on the other hand, is provided with a centrosome, but lacks the substance in which this organ of division may exert its activity. Through the union of the two cells in fertilization all of the essential organs necessary for division are brought together; the egg now contains a centrosome which by its own division leads the way in the embryonic development." [1]

Additional evidence was soon furnished by Vejdovsky, who, in the case of Rhynchelmis, followed the disappearance of the egg centrosome, a thing which Boveri had not actually done. Fol, however, in 1891, described the remarkable process in the echinoderm egg, which he called the "Quadrille of Centers," and maintained that the egg centrosome and sperm centrosome divide, each into two, the daughter centrosomes then conjugating, a maternal with a paternal one, to form the two centrosomes of the first cleavage spindle. His paper was generally accepted, in spite of the earlier work on the subject, and was confirmed by the results of Guignard, Conklin, Blanc, Van der Stricht, and Schaffner. Belief in the existence of the "quadrille" was destined to be dissipated in the light of later research, and a score of investigators have definitely proved its mythical character; among these may be mentioned Fick, Wilson and Mathews, Mead, Boveri, Hill, Rückert, Reinke, Kostanecki and Wierzejski, Sobotta, and several others. A return has, therefore, been made to Boveri's original contention that the cleavage centrosomes are derived solely from the sperm centrosome, and, as the

[1] *The Cell in Development and Inheritance.* By E. B. Wilson. New York, 1896, pp. 141, 142.

observations extend over a very wide range of forms, the applicability of the view to the whole animal kingdom has been generally accepted.

There has been one discordant account, however, since Wheeler, in 1895, published a preliminary paper[1] in which he maintained that in the case of *Myzostoma glabrum* the egg centrosome persists and divides to form the cleavage centrosomes. This observation, coming from such an able investigator and being supported by the unqualified statement that no trace of centrosome or archoplasm could be detected in connection with the sperm nucleus, carried with it great weight; but, as it stood a solitary exception to the recent work on the subject, criticism was for the greater part suspended until a more detailed description had appeared. His completed paper[2] has recently been published, giving additional figures and stronger evidence in support of his position. One would have accepted his results unhesitatingly, had it not been for the fact that there has since appeared a paper[3] by Kostanecki, who has worked on the eggs of the same species, *M. glabrum*, and arrived at conclusions absolutely at variance with Wheeler's. This investigator is unable to find any persisting egg centrosome, which, he states, utterly disappears after the extrusion of the second polar body, but he does see a small, clear, archoplasmic area lying close to the side of the sperm nucleus, and containing one or two centrosomes and later distinct radiations. This sperm aster by division forms the amphiaster of the first cleavage, and the author concludes that Myzostoma presents no exception to the view of Boveri. It is unfortunate that Kostanecki had not seen Wheeler's final paper before the publication of his own work, as much of his criticism of the latter's figures in the preliminary note is destroyed by the more detailed description and by new and clearer figures in the later account.

In regard to the maturation processes, the two authors are in agreement on essential points, but it might be mentioned that Wheeler was only able to find a "Zwischenkörper" in the second polar mitosis, while Kostanecki states that he has seen it in the first as well, although he does not figure it.

After the formation of the polar bodies and the two re-formed vesicular pronuclei have begun to approach each other, there is a period when neither Wheeler nor Kostanecki has discovered in many

[1] *Journ. Morph.*, vol. x, No. 1, 1895.
[2] *Archiv. de Biol.*, tome xv, fas. 1. 1897.
[3] *Archiv. f. mikr. Anat.*, Bd. li, Heft 3. 1898.

eggs any trace whatever of centrosome or archoplasm in connection with either nucleus. In more favorable sections at this stage, however, an archoplasmic field, very faint at first, but later showing centrosomes and radiations, is observed by Wheeler lying close to the egg nucleus, but no indication of such structures is found near the sperm nucleus. Kostanecki's observations, on the other hand, are precisely the reverse, the centrosome and archoplasm, when visible at all, being seen just outside the membrane of the sperm nucleus, while nothing of the kind accompanies the egg nucleus.

Here we are confronted by totally contradictory observations of two able investigators, working on the eggs of the same species of animal, and until one or the other author is confirmed by future study of the fertilization of the egg of *Myzostoma glabrum* judgment in this case will have to be withheld.

The doubt which Wheeler's work, of late the sole remaining contradiction, has seemed to cast on the universal validity of Boveri's view throughout the animal kingdom is, at all events, greatly diminished by the recent publication of Kostanecki.

GEORGE LEFEVRE.

Plankton Studies on Lake Mendota.[1]—This paper, being a report of the continuation of Professor Birge's work on Lake Mendota, is by far the most important American contribution, to our knowledge, of the biology of lakes. It contains the results of observations and collections made at maximum intervals of two weeks during a period of two years and a half. These observations have been worked out with infinite care and patience, and the conclusions are of very great interest. The author does not maintain that the conclusions are in all cases final, as, indeed, that would be impossible, because of the very complex character of the problems attacked. But he certainly is to be congratulated on the amount he has been able to accomplish.

It is impossible for a reviewer, within any reasonable limits, to treat of the paper, for, while it is a somewhat bulky production — covering 174 pages of the eleventh volume of the *Transactions of the Wisconsin Academy* — it is really so much condensed that one cannot make an abstract of its contents. All that can be attempted is to indicate the subjects treated.

After a brief discussion of the methods employed in the investigation, the divisions of the paper are taken up in the following order:

[1] Plankton Studies on Lake Mendota. II. The crustacea of the plankton, July, 1894–December, 1896. By E. A. Birge, Professor of Zoology in the University of Wisconsin. *Trans. Wisconsin Acad. Sci.*, vol. ii.